



IMPROVING SITE CHARACTERIZATION EXTRACTING VALUE FROM YOUR DRONE DATA

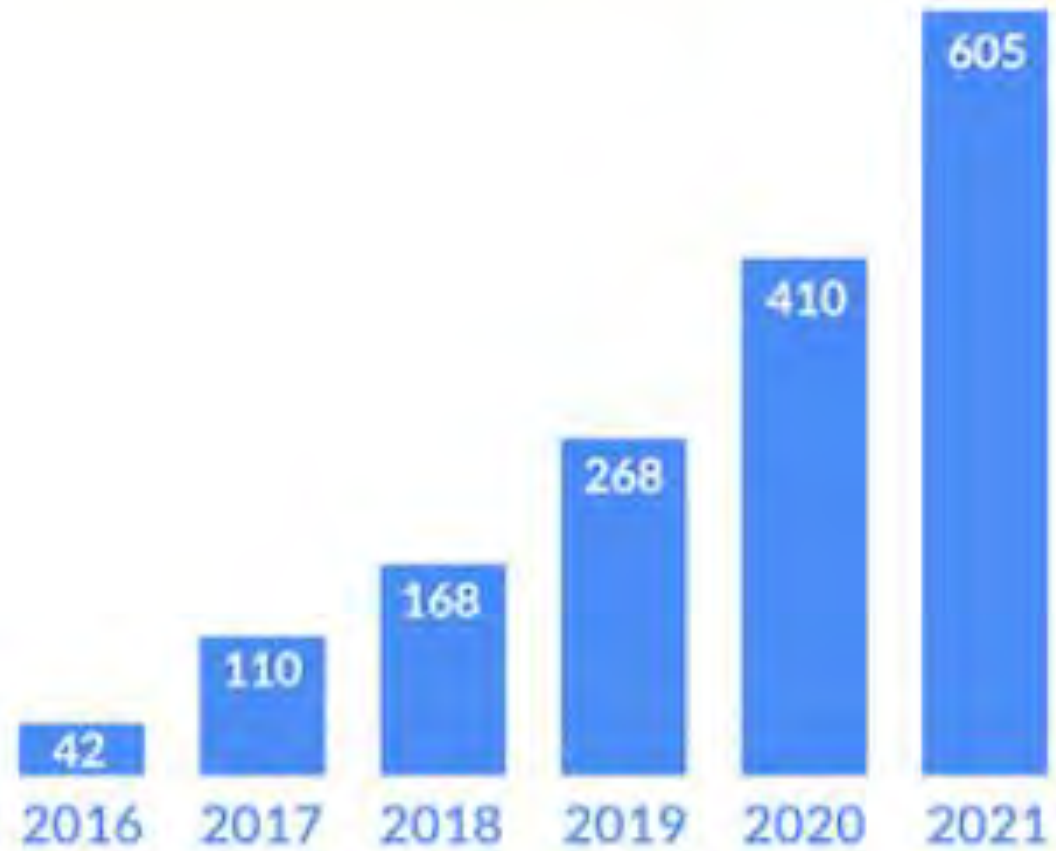
WHAT'S THE FLIGHT PLAN?

- Tech Trends
- Superfund Mine Case Study
- Vegetation Reclamation Case Study
- Where we are
- Where we are going
- Discussion



EVOLUTION OF DRONES AND SENSORS

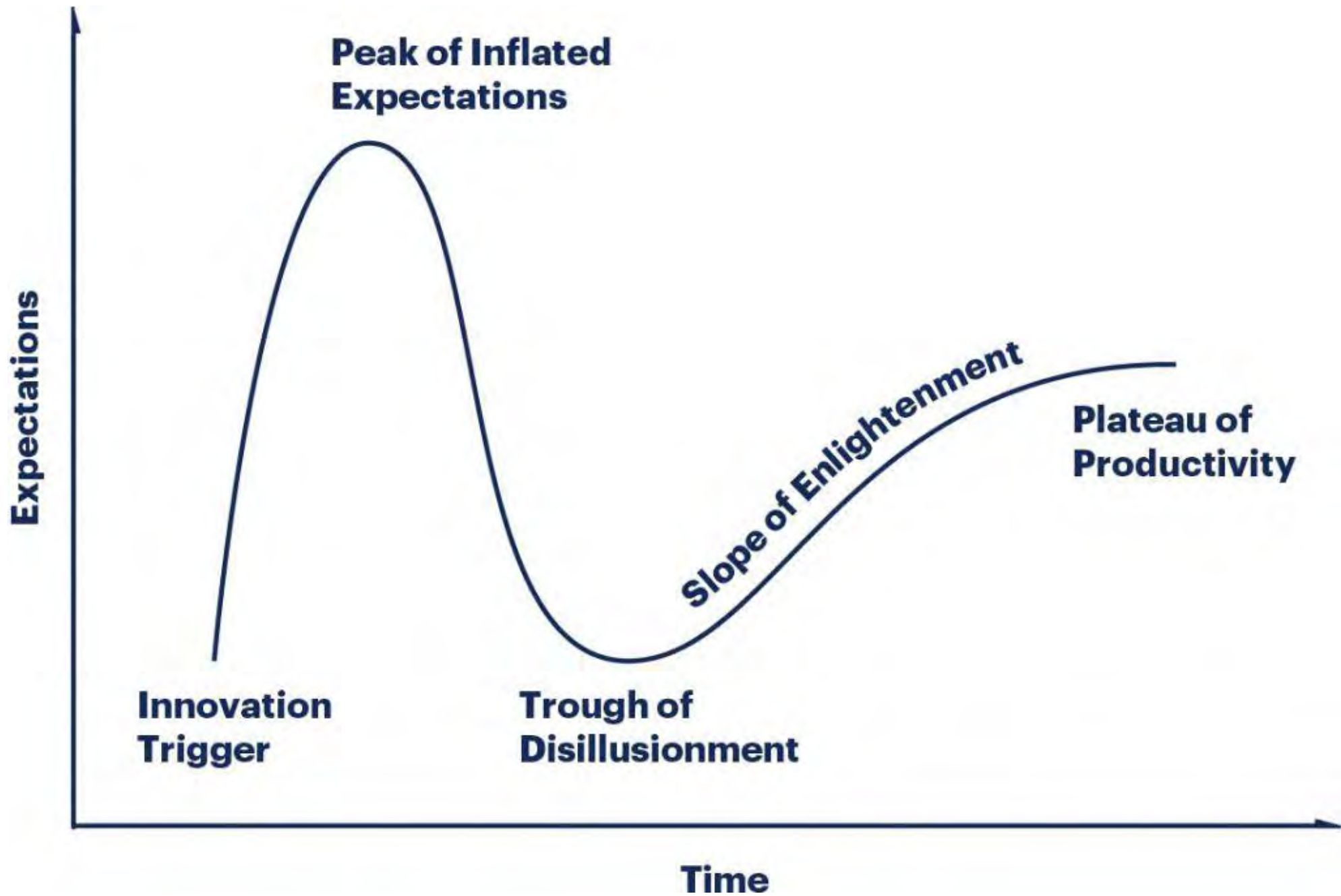
Commercial Drones ('000s)

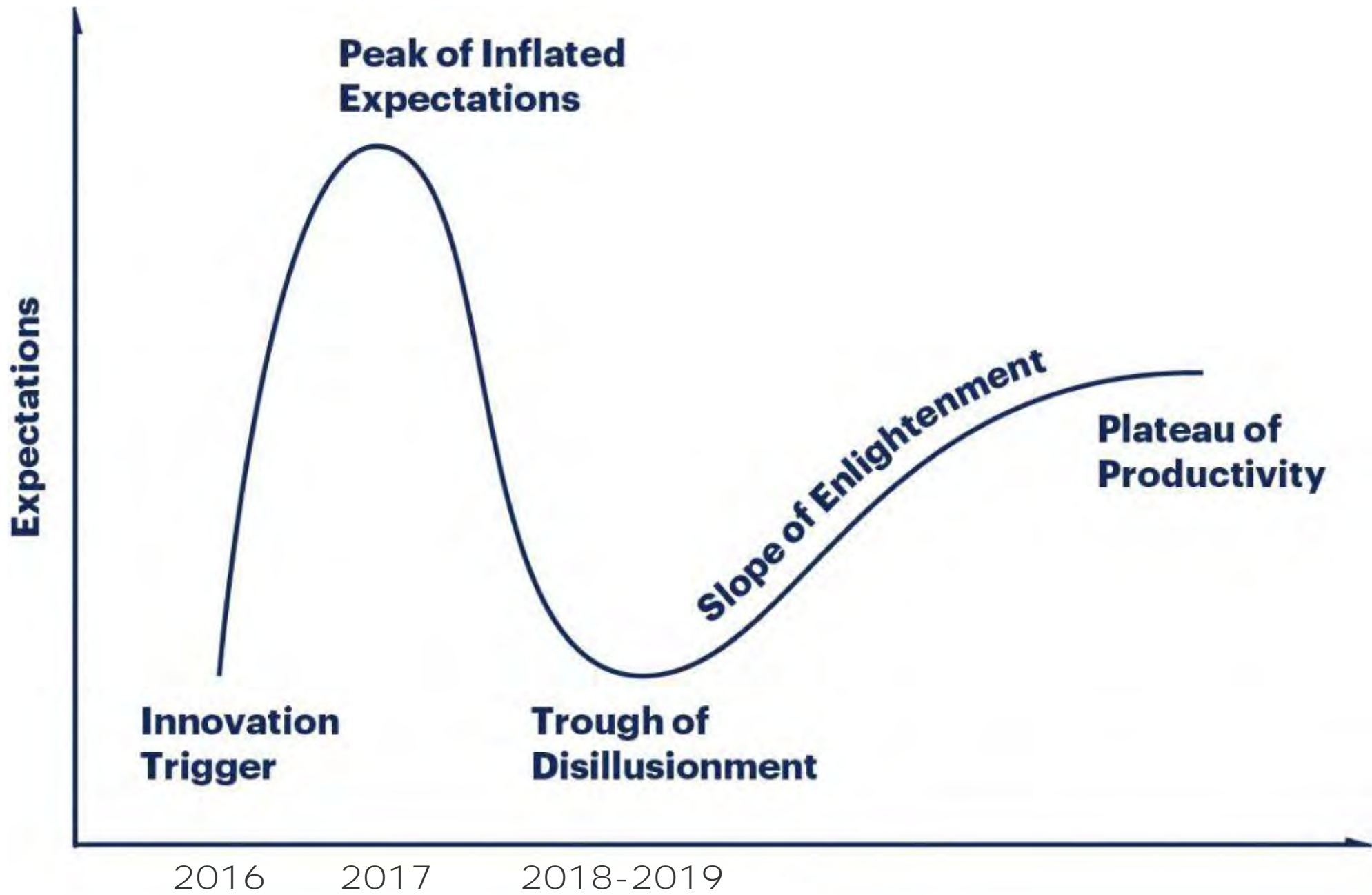


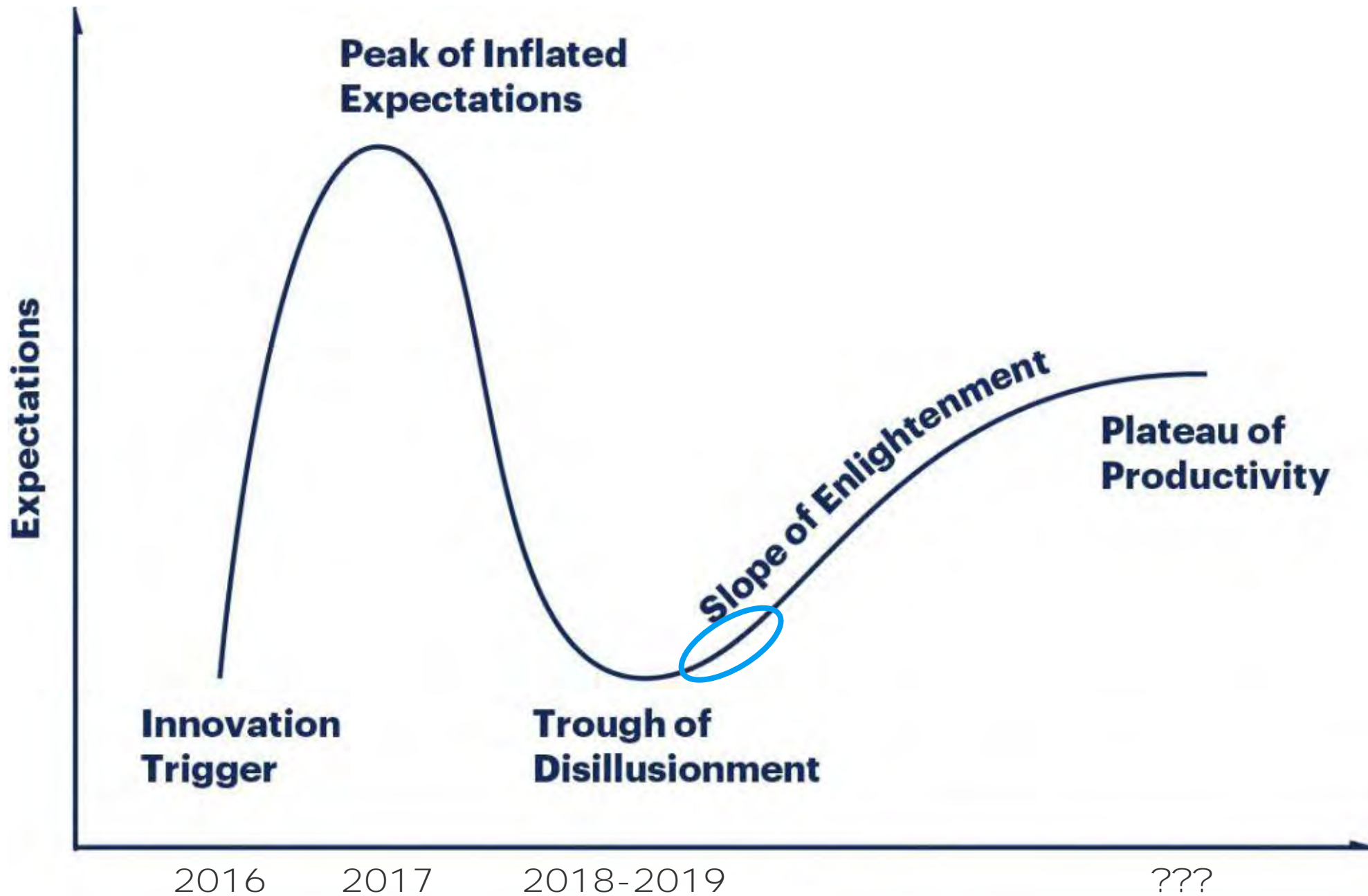
EVOLUTION OF DRONES AND SENSORS

Commercial Drones ('000s)



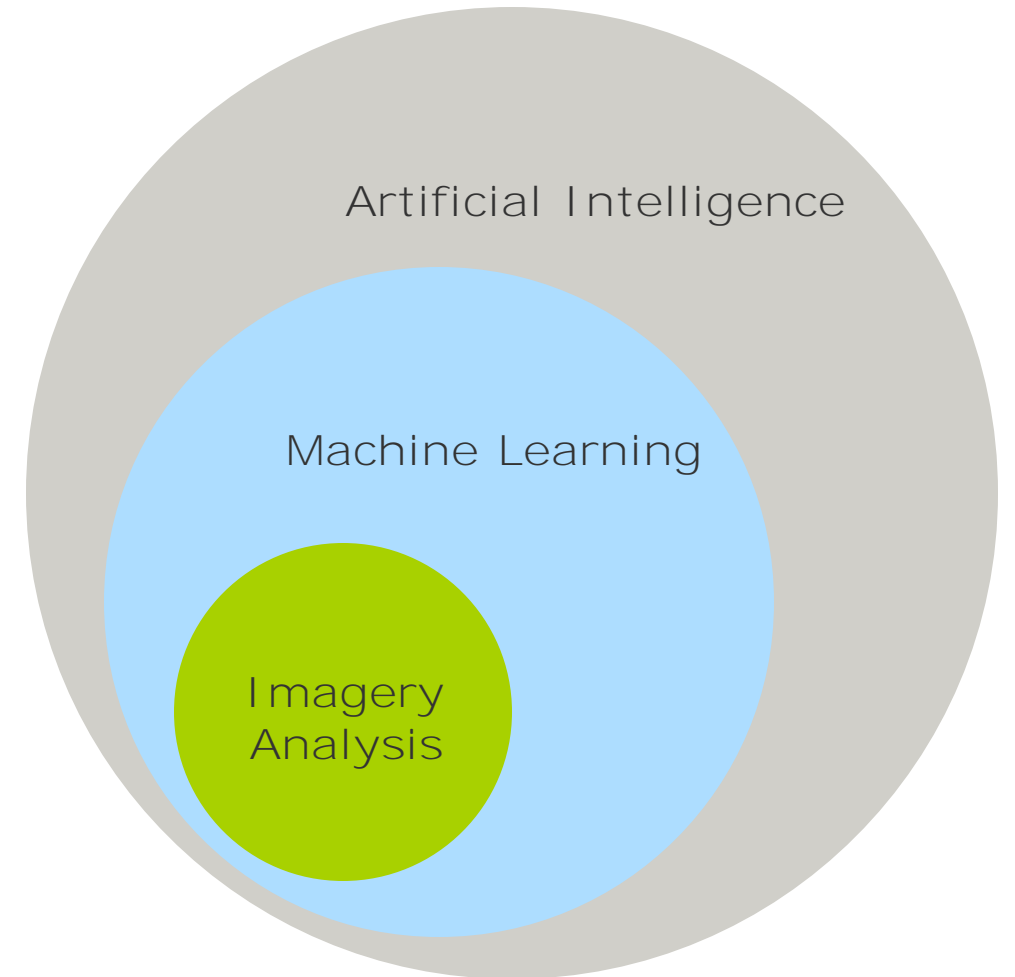






OUT OF THE TROUGH! MACHINE LEARNING

- Machine learning is an approach where you train a computer to make decisions or prediction without explicitly programming the computer to perform those tasks.
- Day-to-day examples:
 - refining search engine results
 - email spam filtering
 - customer product recommendations
 - speech recognition
 - facial recognition
 - image classification



WELCOME TO RAMBOLL AI

Technology, Data, and Expert Analysis

 CONTACT US

SERVICES

Powered by Ramboll

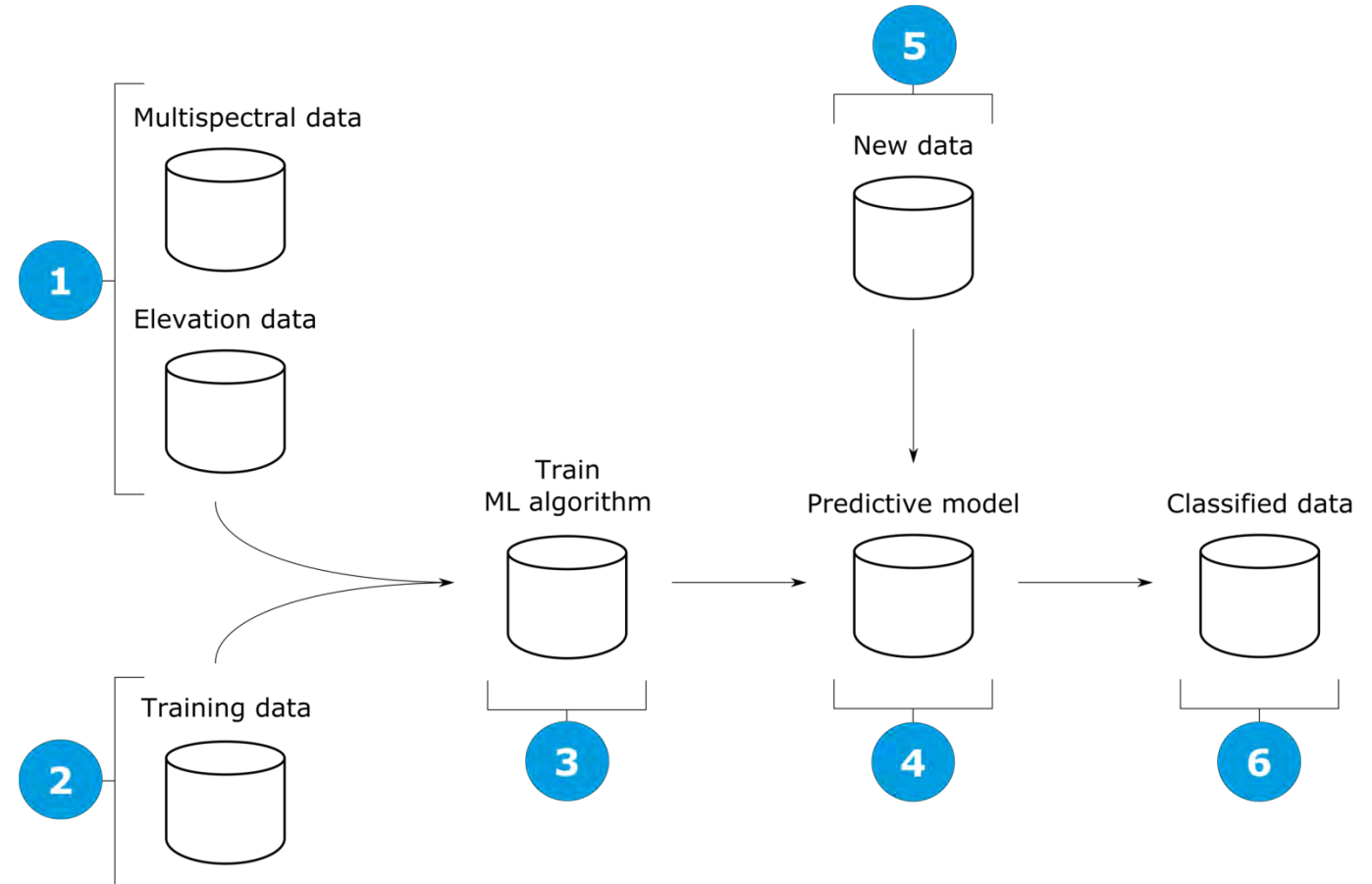
galago

RAMBOLL

- Ramboll service focused on helping de-risk environmental remediation and restore land for future generations
- Service combines new data collection technologies and advanced geospatial analytics to help plan, implement, and monitor restoration

HOW IT WORKS

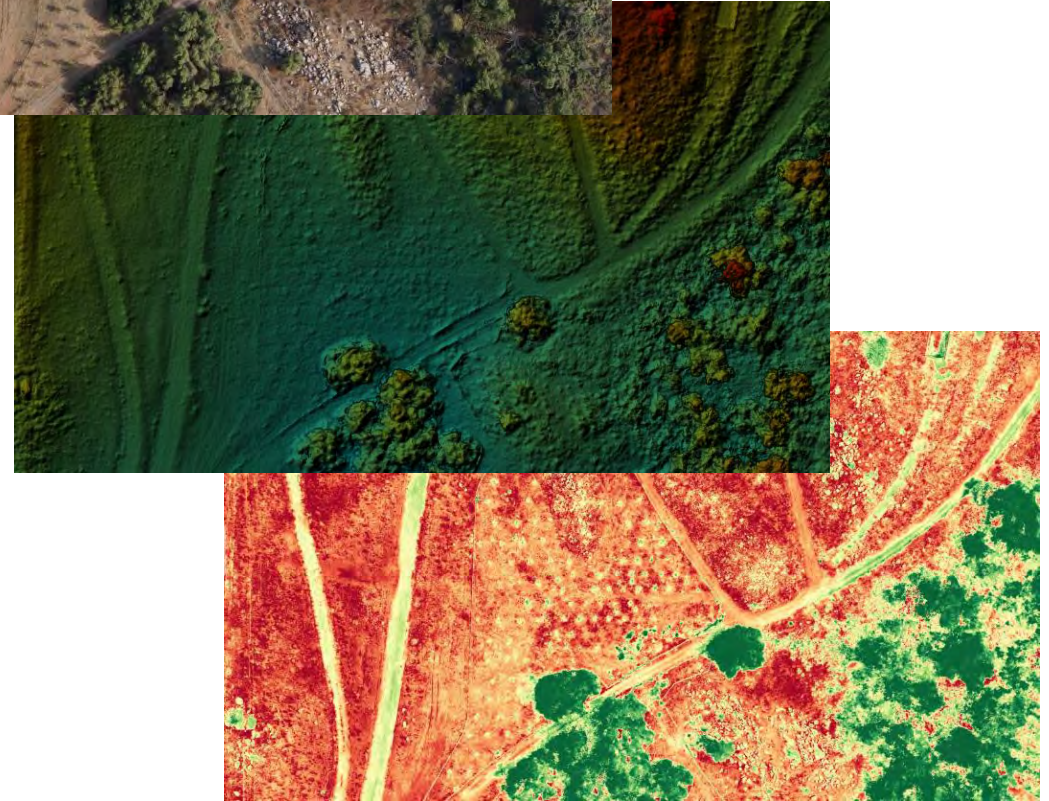
1. Input imagery data
2. Provide training data
3. Train a machine learning algorithm
4. Create a predictive model
5. Analyze new data with model
6. Output a classified dataset



DRONE DATA

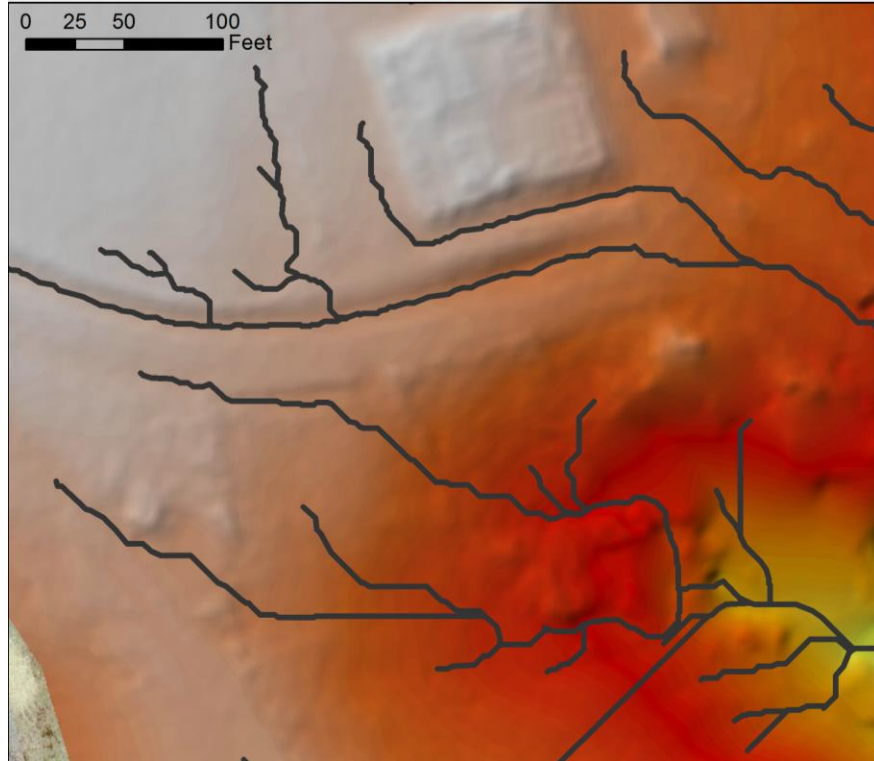
WHAT DATA IS PRODUCED?

- Aerial Imagery
- Aerial Videography
- High-resolution orthomosaic imagery
- Digital terrain model
- Digital surface model
- Point-cloud (.LAS)
- Multi-spectral imagery
- Thermal
- And more!



HOW CAN DRONE DATA HELP?


SPATIAL SCALE



HOW CAN DRONE DATA HELP?

MONITORING CHANGES OVER TIME



An aerial photograph of a rugged mountainous landscape. A winding road or railway track curves through the terrain, which is covered in dense evergreen forests and patches of snow. In the upper right, a small settlement with several buildings is visible. The foreground shows a steep, rocky slope with some snow and a small stream or road.

SUPERFUND MINE CASE STUDY

Mine Feature Identification



Hidden hazards in the forest: Closing Colorado's abandoned mines

Across The West And Colorado, Old Mines Drive Curiosity And Danger

BY THE ASSOCIATED PRESS OCT 30, 2018

SHARE THIS:



Colorado safety agency closing 25 abandoned mines in Silverton area

News | October 1, 2018



DURANGO (AP) — Agencies are in the process of closing 25 abandoned mines on the

Parents of Colorado teens who died after crashing down unfilled Boulder County mine shaft sue state, feds | The Denver Post

Funding to reclaim abandoned mines falls short

230 Colorado mines are leaking heavy metals into state rivers



50 million gallons of polluted water pours daily from mine sites across the U.S., including Colorado

Why Tens of Thousands of Toxic Mines Litter the U.S. West

The spill in Colorado's Animas River highlights the problem of wastewater building up in abandoned mines

NEWS · COLORADO NEWS

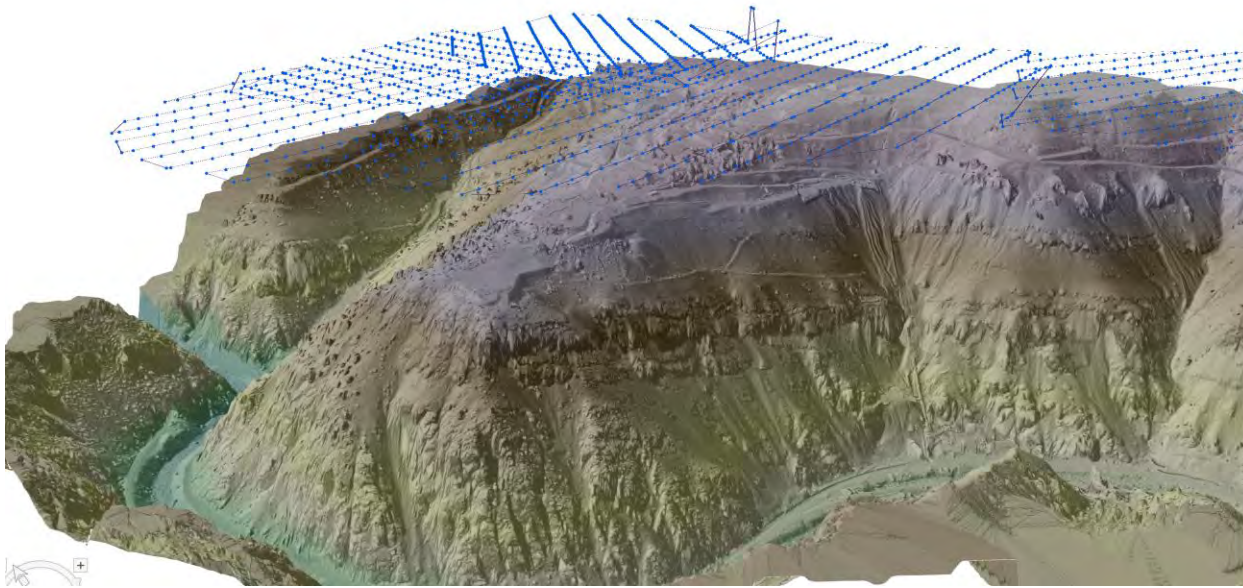
One of Colorado's worst Superfund sites has been fixed, but the state's on the hook for \$2M a year to keep it clean

EPA to give Colorado a forever bill for continued care of Summitville Mine






HOW CAN DRONE DATA HELP? ASSET IDENTIFICATION



Status

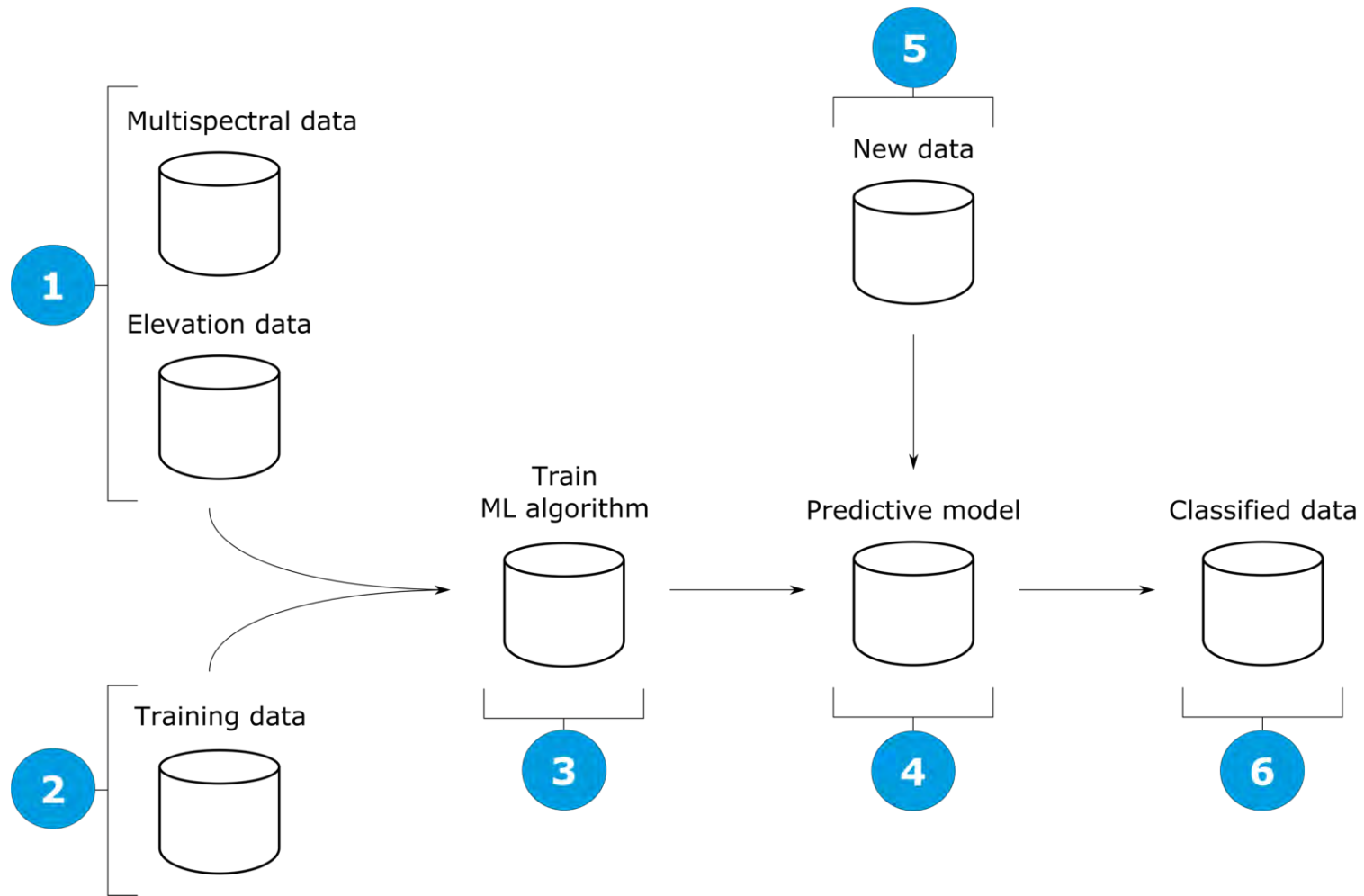
- Confirmed
- Suspected



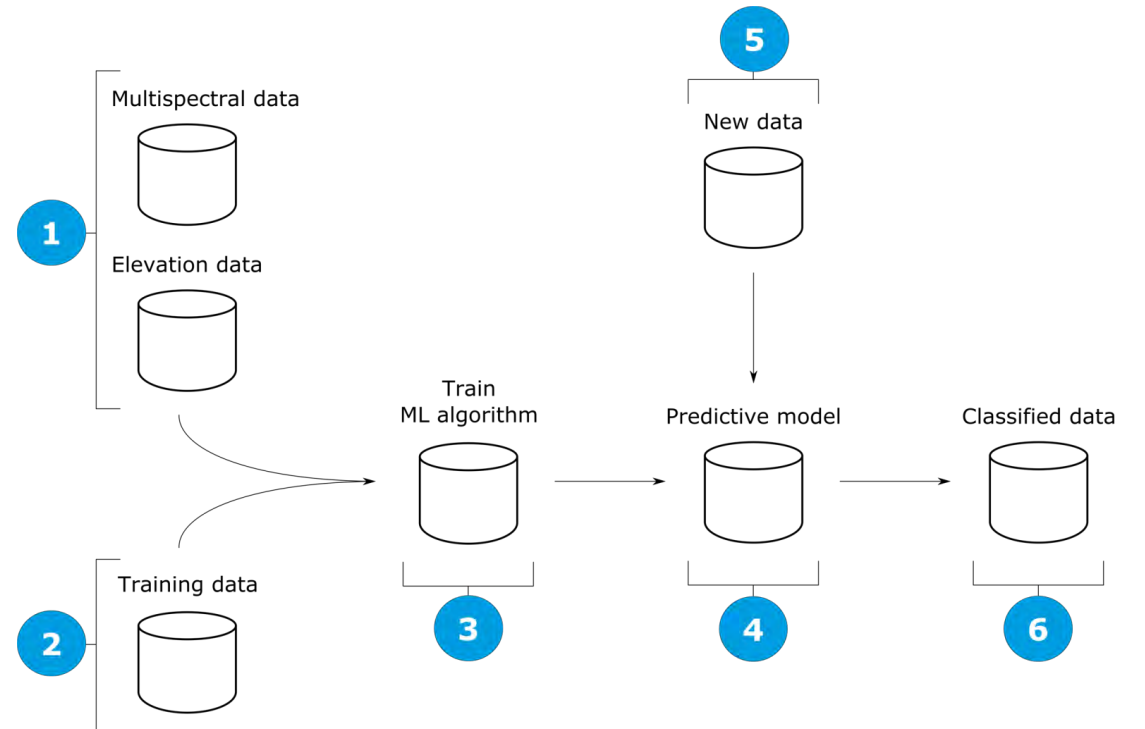


VEGETATION RECLAMATION CASE STUDY

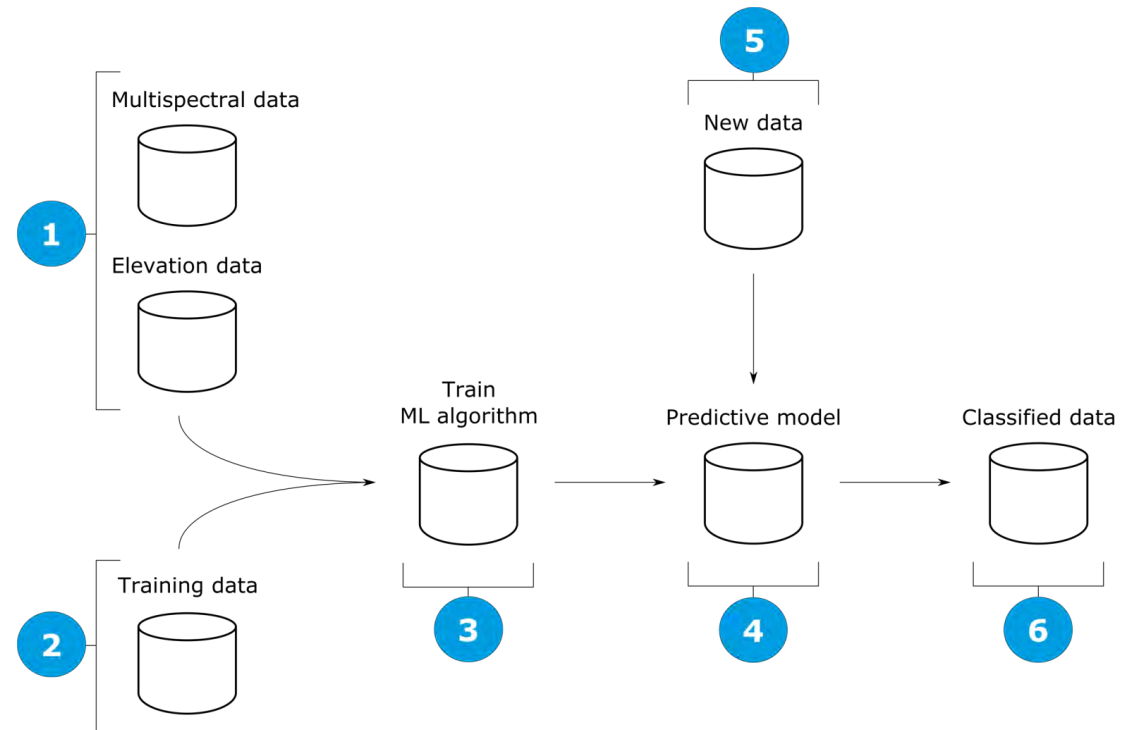
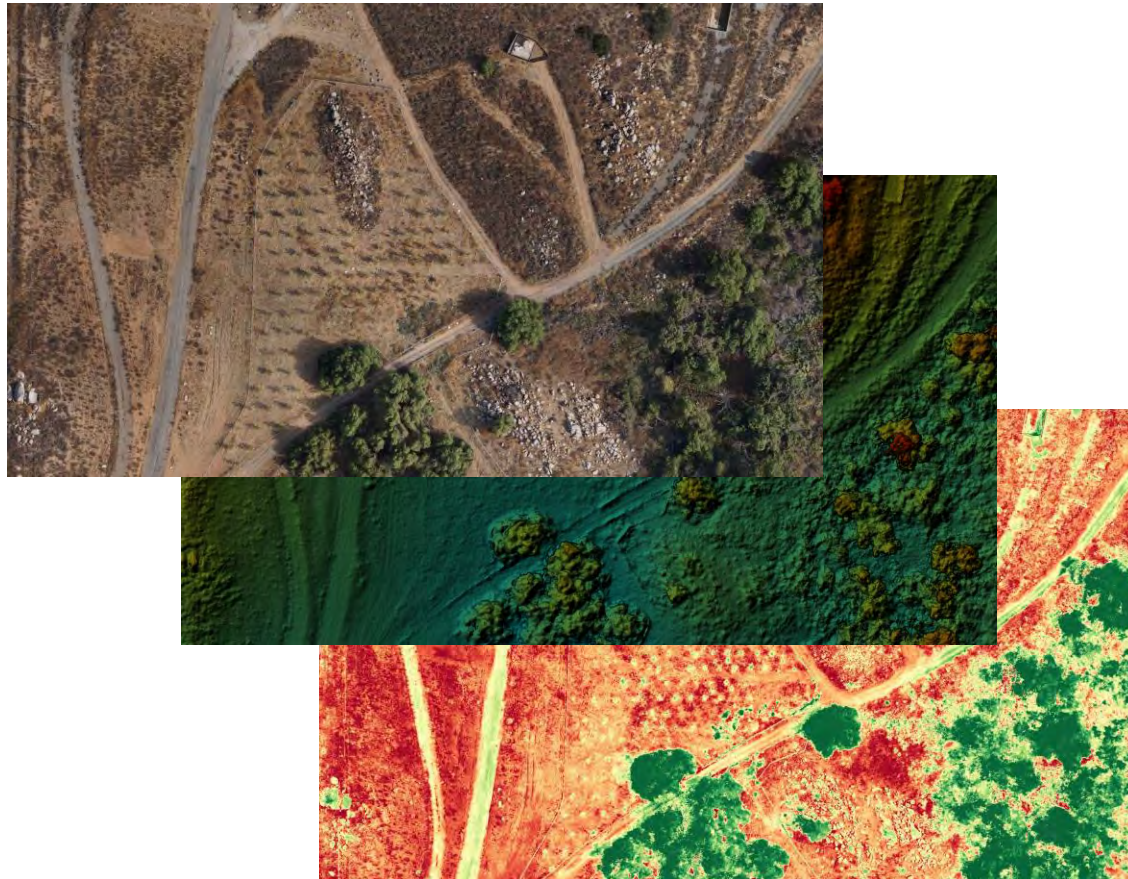
Invasive Species and Vegetative
Cover



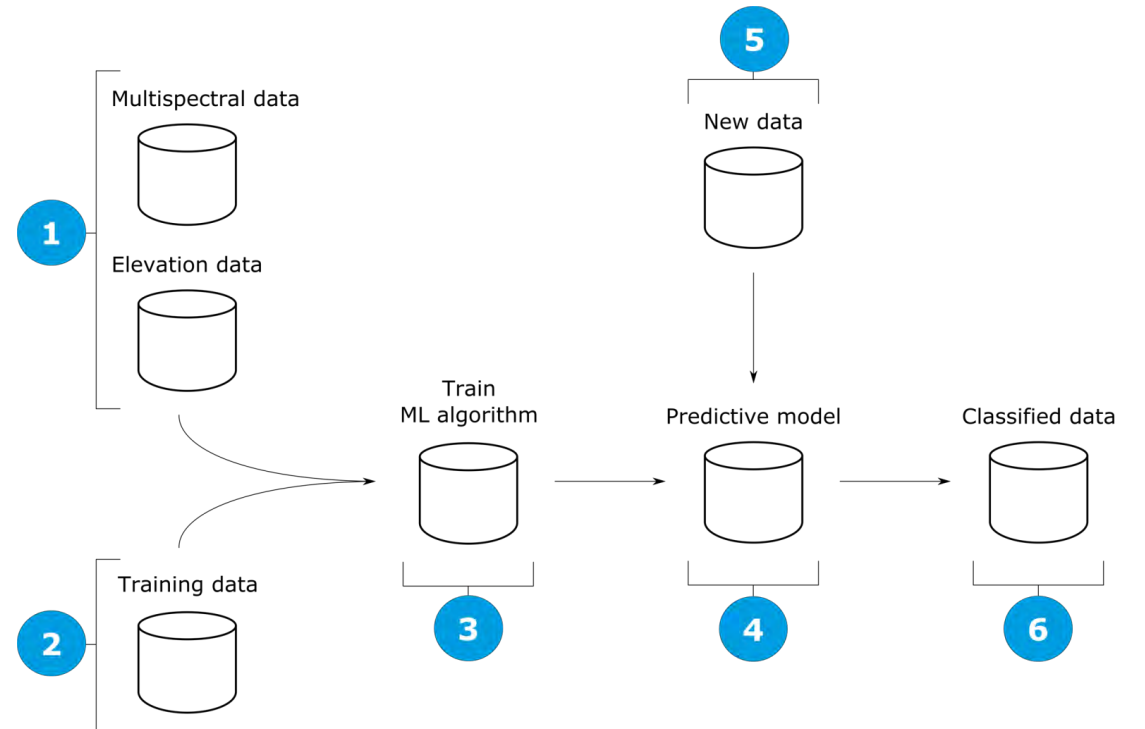
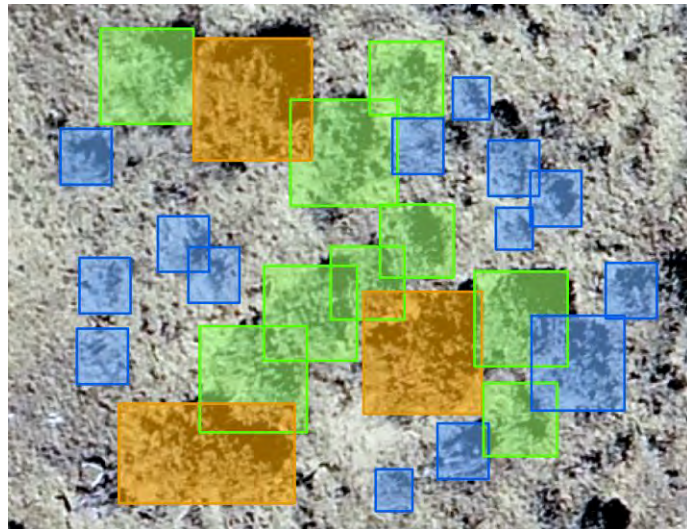
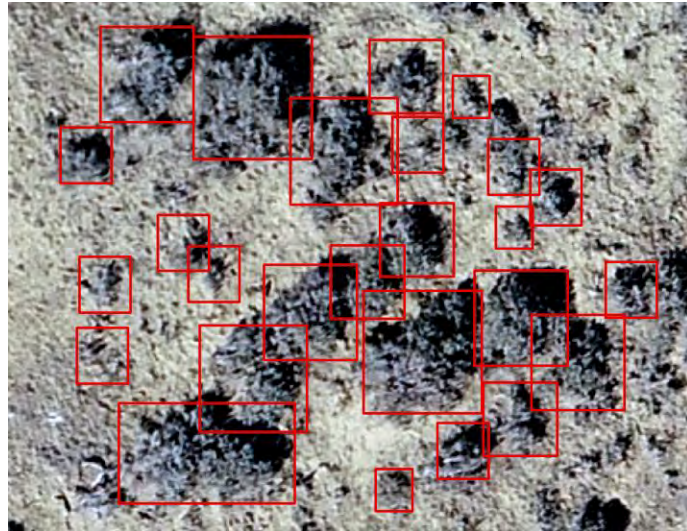
TRAINING DATA



DRONE DATA



TRAIN ML ALGORITHM





Press **F11** to exit full screen

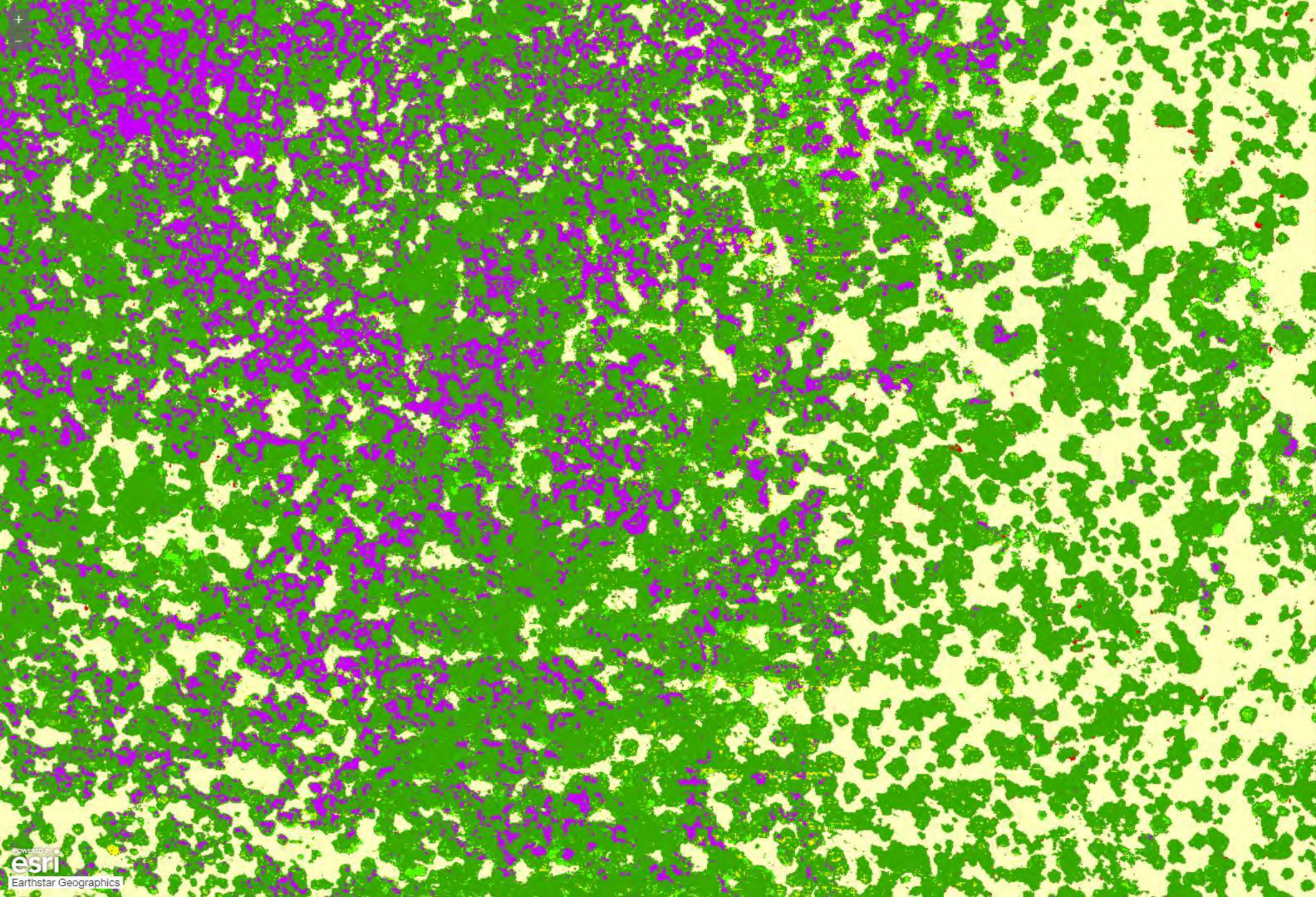
Layer List



Layers



- Vegetation Classification ...
- Digital Terrain Model (feet) ...
- Orthomosaic from Drone Imagery ...



Layer List



Layers



- Vegetation Classification ...
- Digital Terrain Model (feet) ...
- Orthomosaic from Drone Imagery ...

SUMMARY

Opportunities

- "...making maps that we've never been able to make before..."
- Significant improvement in efficiencies over older jobs
- Very high-resolution data at a relevant temporal scale

Challenges

- Data management
 - "Oceans of data"
- Data analysis
 - Making actionable
 - More than pretty pictures
- Flight operations



DISCUSSION



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